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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

JEFFERSON, QUOVAUNDA

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/542,123	Applicant(s) POPOV ET AL.	
	Examiner QUOVAUNDA JEFFERSON	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 August 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al, US Patent Application Publication 2004/0126993 (as cited in a previous Office Action), in view of Gonzalez, US Patent 6,635,552.

Regarding claim 1, Chan teaches a method for producing a silicon-on-insulator structure including hydrogen implantation in a silicon wafer, chemical treatment of the wafer and a substrate, joining of the wafer and substrate, splicing and splitting of the wafer along a layer of the implanted hydrogen, the improvements wherein at least drying and removing of physically adsorbed substances from the surfaces of the wafer and substrate after the chemical treatment is carried out **(this treatment being the formation oxide film)** in a first vacuum at a first moderate temperature such that the implanted hydrogen stays bound [0029], and at least one of the joining and splicing of the wafer and substrate and exfoliating along the layer of implanted hydrogen is carried out **(this being the joining of the wafer and substrate)** at a second moderate

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temperature the same as or slightly higher than the first moderate temperature such that the implanted hydrogen mostly stays bound [0036, 0037].

Chan fails to teach at least one of the joining and splicing being carried out in a second vacuum.

Gonzalez teaches at least one of the joining and splicing being carried out in a second vacuum (column 4, line 48 to column 5, line 26) by teaching the conventional bonding of two wafers in a vacuum of less than 10 mTorr at a temperature of less than 500 degrees Celsius when one of the wafers contains a damaged layer of implanted hydrogen so as to prevent the cleaving of said damage layer.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Gonzalez with that of Chan by teaching the conventional bonding of two wafers in a vacuum of less than 10 mTorr at a temperature of less than 500 degrees Celsius when one of the wafers contains a damaged layer of implanted hydrogen so as to prevent the cleaving of said damage layer.

Regarding claim 6, Chan and Gonzalez fail to teach a thickness of thermally grown oxide SiO₂ on the substrate is 0.01 to 3 μm .

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claim 7, Chan teaches the substrate is glass [0023].

Chan and Gonzalez fail to teach the substrate has a thickness about 500 μm .

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

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An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claim 8, Chan teaches the substrate is quartz [0011].

Chan and Gonzalez fail to teach the substrate has a thickness about 500 μm .

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

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data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claim 9, Chan teaches at least one of the first and second temperatures is 80 to 350°C for 0.1 to 100 hours [0037], while Gonzalez teaches at least one of the first and second vacuums is 10 to 10⁴ Pa (column 5, line 7).

Regarding claims 10 and 11, Chan teaches wherein at least one of the first vacuum or temperature is the same as the second vacuum or temperature [0036].

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chan and Gonzalez, as applied to claims 1 and 6-11 above, and further in view of Aga et al, US Patent 6,846,718 (as cited in a previous Office Action).

Regarding claim 4, Chan and Gonzalez fail to teach a thermal annealing is carried out at 1100° C during 0.5 to 1 hour after splitting.

Aga teaches is carried out at 1100° C during 0.5 to 1 hour after splitting (column 1, lines 60-67) as a means to improve the surface roughness of the SOI layer surface immediately after delaminating.

It would be obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Aga with that of Chan and Gonzalez as a means to improve the surface roughness of the SOI layer surface immediately after delaminating.

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan and Gonzalez as applied to claims 1 and 6-11 above, and further in view of Ogura, US Patent 6,211,041.

Regarding claim 2, Chan and Gonzalez fail to teach the hydrogen implantation is carried out through a thermally grown silicon dioxide layer with a thickness of 5 to 50 nm.

Ogura teaches the hydrogen implantation is carried out through a thermally grown silicon dioxide layer **3** (figure 1C) by teaching the conventional process for forming an SOI wafer through a delamination process in which the hydrogen implantation process occurs in the wafer with the silicon dioxide to transfer the silicon oxide wafer to another support wafer.

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It would be obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of Ogura with that of Chan and Gonzalez by teaching the conventional process for forming an SOI wafer through a delamination process in which the hydrogen implantation process occurs in the wafer with the silicon dioxide to transfer the silicon oxide wafer to another support wafer.

Chan, Gonzalez, and Ogura fail to teach the silicon dioxide layer has a thickness of 5 to 50 nm.

However, given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved See *In re Aller*, Lacey, and Hall (10 USPQ 23 3-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d

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1091,231 USPQ 375 (Fed. Cir. 1986). Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. Ex parte Ishizaka, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. In re Burckel, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Regarding claim 3, Chan and Gonzalez fail to teach the hydrogen implantation is carried out with H_2^+ or H^+ ions with doses from 1.5 to $15 \times 10^{16} \text{ cm}^2$ and energies 20 to 200 keV, respectively.

Ogura teaches the hydrogen implantation is carried out with H_2^+ or H^+ ions with doses from 1.5 to $15 \times 10^{16} \text{ cm}^2$ and energies 20 to 200 keV, respectively (column 7, lines 51-52) as a conventional range in which to implant hydrogen into a wafer with a silicon dioxide layer on top.

It would be obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of Ogura with that of Chan and Gonzalez as a conventional range in which to implant hydrogen into a wafer with a silicon dioxide layer on top.

Claims 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan and Gonzalez as applied to claims 1 and 6-11 above, and further in view of Chan, US Patent 6,274,459 (herein referred to as Chan'459, as cited in a previous Office Action).

Regarding claim 5, Chan and Gonzalez fail to teach thermal oxidation with following chemical etching with diluted hydrofluoric acid or a touch chemical-mechanical polishing (CMP) for removing an upper rough layer after the exfoliating.

Chan'459 teaches thermal oxidation with following chemical etching with diluted hydrofluoric acid or a touch chemical-mechanical polishing (CMP) for removing an upper rough layer after the exfoliating (column 9, lines 53-67) as a conventional means in which to smooth a rough surface after a delaminating process.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Chan'459 with that of Chan and Gonzalez as a conventional means in which to smooth a rough surface after a delaminating process.

Response to Arguments

Applicant's arguments, see page 2, filed August 14, 2008, with respect to the rejection(s) of claim(s) 1-11 under 35 USC 103(a) have been fully considered and are

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persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to QUOVAUNDA JEFFERSON whose telephone number is (571)272-5051. The examiner can normally be reached on Monday thru Friday 7AM-3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michelle Estrada/
Primary Examiner, Art Unit 2823

QVJ